

CLAIMS

1 – Method for the management of radio resources in a communication network R comprising at least one central database REM_C containing information relating to the scheduling of the communication network R at a given time, and one or more mobile stations (10i) comprising a database (REM_{ri} , 22i) containing information on a radio environment of the mobile station, characterized in that it comprises at least the following steps:

- transmitting a communication request R_q sent by a mobile station (10i) to a REM analysis algorithm module (21) and also to a REM_{ri} database (22) of the mobile station, said communication request R_q comprising characteristics relating to the constraint of a required quality of service,
- the analysis algorithm analysing the communication parameters contained in the request R_q taking account of the required quality of service (QoS) and of parameters characterizing a radio situation in a coverage area and at a given time sent by the REM_{ri} ,
- determining if a latency constraint exists in the request R_q ,
 - if the communication request R_q can tolerate a time-delay Δt before establishing the communication, transmitting the request R_q to a time-delay step (24) before it is analysed again by the REM analysis module (21),
 - if the request R_q cannot tolerate a time-delay Δt before establishing the communication, then allocating a communication link to a mobile terminal (25) and initiating the communication (26), and transmitting data and returning a report containing information on events that occurred during the communication.

2 – Method according to Claim 1 characterized in that the analysis algorithm comprises the following three phases:

- calculating the available QoS value,
- calculating the probability that the target QoS is supported by the QoS that can be allocated to a link,

- verifying for each frequency/channel of the coverage area of a mobile station the probability that the target QoS constraint will be complied with, and choosing the link to be allocated as a function of that probability value.

5 3 – Method according to Claim 2, characterized in that the calculation of the probabilities considering a parameter QI characterizing the radio link comprises the following steps:

- adopting a Gaussian distribution hypothesis,

- the target parameter QI being known in the request Rq, the parameter QI_{LIEN} available on the link being calculated and with μ_i and σ_i respectively
10 corresponding to the mean value and to the standard deviation associated with each radio link i , determining the probability that the parameter $QI_{QOS-CIBLE}$ is less than the parameter QI_{LIEN} that can be allocated to a radio link i :

$P_r(QI_{QOS-CIBLE} \leq QI_{LIEN})$ with:

15 $Pr(QI_{QOS-CIBLE} \leq QI_{LIEN}) = 1 - \text{erf}\left(\frac{QI_{QOS-CIBLE} - \mu_i}{\sigma_i}\right)$ where erf is the error function mathematical function,

- knowing the available links and the probabilities for each of those links, applying a cost function and determining the link to be used to satisfy a quality of service of a request Rq.

20

4 – Method according to Claim 3 characterized in that there is used as a parameter characterizing a radio link the target data rate $D_{QOS-CIBLE}$ for the required QoS parameter and the calculated available data rate D_{LIEN} on the link.

25 5 – Method according to Claim 1 characterized in that there are used as quality of service parameters to be complied with any parameter characterizing the quality of service such as the error rate, the bandwidth, the authorised latency.

6 – Method according to any one of Claims 1 to 5 characterized in that it also
30 comprises the execution of a background task executed on a mobile station (10i) outside the step of sending data in order to probe the radio environment of a mobile station, choosing frequency values stored in the REMri and over a

widened area comprising the cell containing the mobile station and adjacent cells in order to determine the data of the REMri of the mobile station (10i).

7 – Method according to any one of Claims 1 to 6 characterized in that on
 5 reception of priority event information, the analysis algorithm interrupts the current communication and allocates the radio link to the priority communication.

8 – Method according to any one of Claims 1 to 6 characterized in that on
 10 reception of an event modifying the radio environment during a communication or while establishing a communication link, the information is sent to the analysis algorithm and a modification is sent in return to adapt to the new situation.

15 9 – System for the management of radio resources in a communication network R comprising at least one central database REM_C containing information relating to the scheduling of the communication network R at a given time, and one or more mobile stations (10i) comprising a database (REMri, 22i) containing information on a radio environment of the mobile station, characterized in that a
 20 mobile station (10i) is equipped with a REM analysis algorithm module (21) configured to analyse the communication parameters contained in a communication request Rq and with regard to the required quality of service (QoS) and parameters characterizing a radio situation in a given coverage area and at a given instant, a decision module (23) supplying the authorization to
 25 initiate a communication and the communication links to be used or the transmission of the request Rq to a time-delay module as a function of a latency parameter contained in the request Rq, a module sending data once the communication is established, a module establishing a communication report in liaison with the database (22i) of the mobile station.

30

10 – System according to Claim 9 characterized in that the analysis module (21) is adapted to execute the following steps:

- calculating the available QoS value,
 - calculating the probability that the target QoS is supported by the QoS that can be allocated to a link,
 - verifying for each frequency/channel of the coverage area of a mobile station
- 5 the probability that the target QoS constraint will be complied with, and choosing the link to be allocated as a function of that probability value.

11 – System according to Claim 10 characterized in that the analysis module is adapted to calculate probability values considering as a quality of service

10 parameter the data rate parameter and to execute the following steps:

- adopting a Gaussian distribution hypothesis,
 - the parameter $Ql_{QOS-CIBLE}$ characterizing the radio link being known in the request Rq, the Ql parameter available on the link Ql_{LIEN} being calculated and, with μ_i and σ_i respectively being the mean value and the standard deviation
- 15 associated with each radio link i ,
- determining the probability that the target parameter $Ql_{QOS-CIBLE}$ is less than the available parameter Ql_{LIEN} that can be allocated to a radio link i :

$P_r(Ql_{QOS-CIBLE} \leq Ql_{LIEN})$ with:

$$Pr(Ql_{QOS-CIBLE} \leq Ql_{LIEN}) = 1 - \text{erf}\left(\frac{Ql_{QOS-CIBLE} - \mu_i}{\sigma_i}\right) \text{ where erf is the error}$$

20 function mathematical function,

- the decision module is adapted to determine the link to be used to satisfy a quality of service of a request Rq taking into account the available links and the probabilities for each of those links.

25 12 – System according to Claim 11, characterized in that the parameter characterizing a radio link is the target data rate $D_{QOS-CIBLE}$ for the required QoS parameter and the calculated available data rate D_{LIEN} on the link.